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Some Xenia Effects of Crosses  
among Certain Varieties of Zea Mays

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SOME XENIA EFFECTS OF  
CROSSES AMONG CERTAIN  
VARIETIES OF ZEA MAYS

BY

ROBERT LUCIUS HEGNAUER

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THESIS

FOR THE

DEGREE OF BACHELOR OF SCIENCE

IN

AGRONOMY

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COLLEGE OF AGRICULTURE  
UNIVERSITY OF ILLINOIS

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Robert Lucius Hegnauer

ENTITLED ... Some Xenia Effects of Crosses among Certain

Varieties of Zea Mays.

IS APPROVED BY ME AS FULFILLING THIS PART OF THE REQUIREMENTS FOR THE

DEGREE OF ... Bachelor of Science in Agronomy.

L. H. Smith

Instructor in Charge

APPROVED:...

C. H. P. C.

HEAD OF DEPARTMENT OF

Agronomy

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*Louie H. Smith*

Instructor in Charge

APPROVED;

*C. Hopkins*

HEAD OF DEPARTMENT OF

*Agronomy*



SOME XENIA EFFECTS OF CROSSES AMONG CERTAIN  
VARIETIES OF ZEA MAYS.

Xenia is the term used to designate the direct effect of pollen on the character of seeds and fruits. It has only been of late years that a satisfactory explanation could be given of this phenomenon. "In 1899 Guignard and Nawaschin made the discovery that the endosperm is a part of the filial generation formed by the development of the endosperm nucleus of the pollen cell." (3) This discovery threw light on the work that had been carried on by DeVries, Correns, and Webber, and during the latter part of 1899 and early part of 1900 similar conclusions were reached by these three men who described xenia as the visible effect of the second male nucleus on the endosperm.

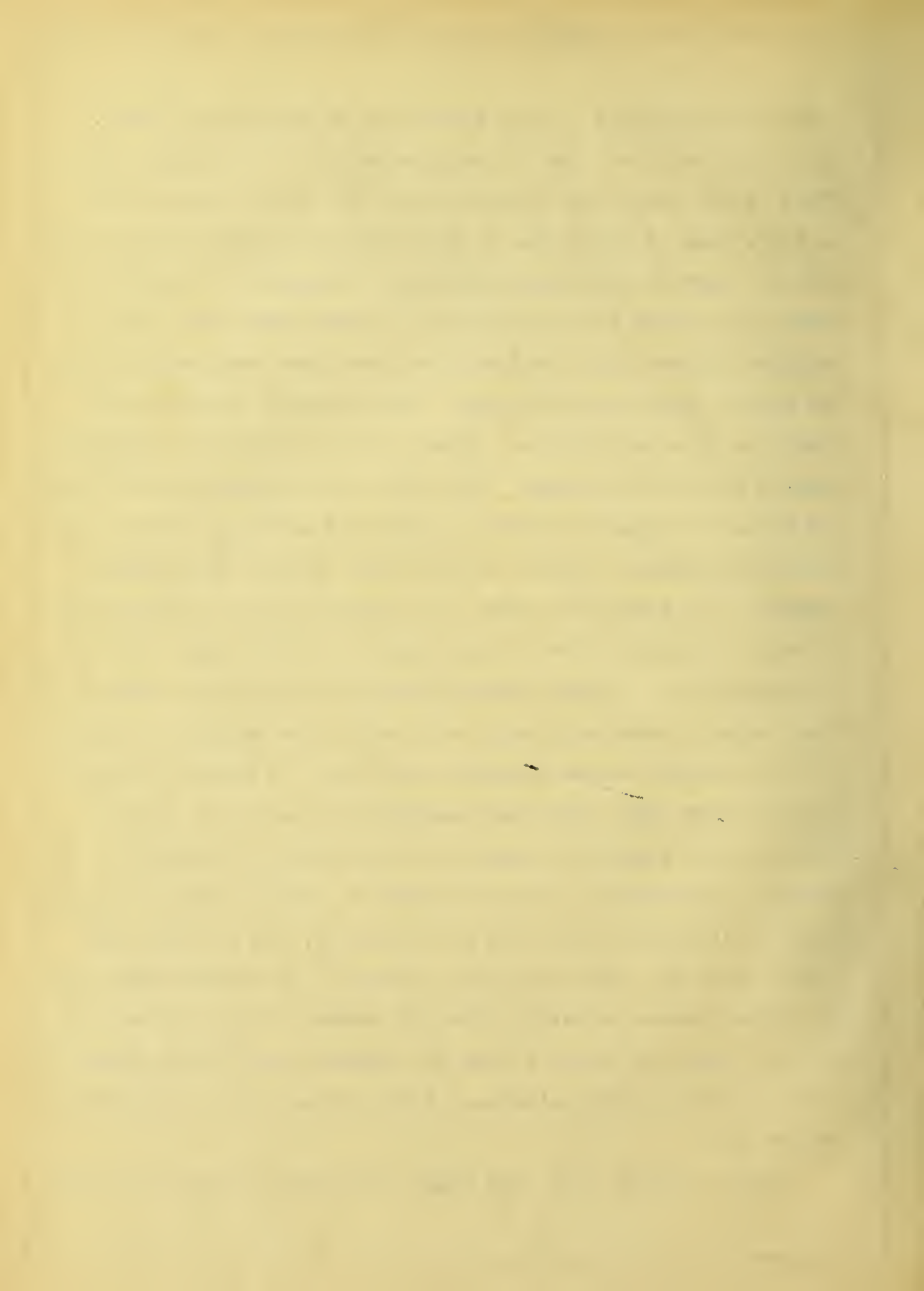
The theory of double fertilization has been quite generally accepted as it was worked out by Nawaschin and Guignard. In this process of double fertilization, which figure I will serve to explain, one of the two generative sperm nuclei ( $G\ Sn$ ) of the pollen unites with the nucleus of the egg cell ( $En$ ), to form what develops into the germ of the seed. The second sperm nucleus ( $G\ Sn$ ) unites with the two polar nuclei ( $P_1$  and  $P_2$ ) of the embryo sac. As a result of the latter fusion the endosperm develops. This gives some idea how the phenomenon known as xenia can operate.

The physiological process of double fertilization has been worked out by investigators as follows. Many pollen grains reach the stigma of the female reproductive organs. The stigma provides a means for the pollen grains to attach themselves



either by presenting a rough surface or by secreting a fluid. This secretion also aids in the germination of the pollen tube. Often it is found that germination of the pollen grains occur on the stigma of the flower in which no fertilization takes place, however sometimes the seed covering is stimulated to develop by coming in contact with the pollen. In many cases protective measures against such foreign pollen have been observed in which the pollen grains are destroyed. Various kinds of pollen will germinate in sugar solution, others will not unless in the presence of part of the stigma. The pollen tube grows from the stigma and makes an attempt to reach the seed bud or ovary, either thru mechanical guidance offered by the style, or thru chemotropic stimulus. As soon as the tube of a pollen grain has reached the micropyle it makes its way to the egg cell in the upper part of the embryo sac. A change takes place in the so called "help cells", they become clouded and their cell nucleii and vacuoles disappear, and the contents become strongly refractive. A drawing together of protoplasm takes place and immediately a secretion is discharged which begins to dissolve the cell wall of the embryo sac, making it possible for the pollen tube to enter. Finally either one or both of the help cells are dissolved, and it seems that they in part are taken up by the egg cell. At the same time that the above process is taking place the surface of the pollen tube is also dissolved, which allows the spermatoplasm and ooplasm to unite, as well as the zytoplasm of the pollen tube to enter the embryo sac.

Xenia in maize is a very common occurrence, indeed this plant



The process of double fertilization as illustrated in Fruwirth Vol. I of Die Zuchtung Der Landwirtschaftlichen Kulturpflanzen.

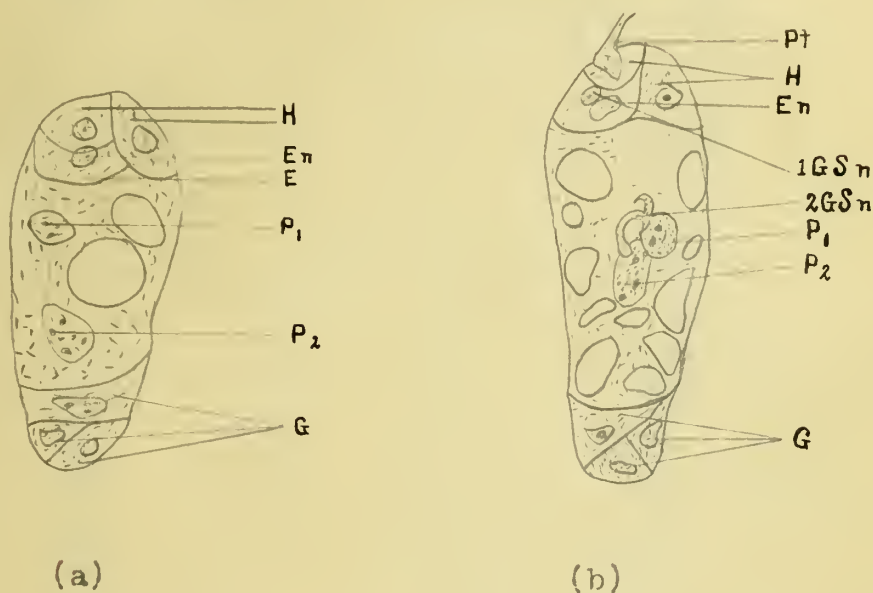


Figure I

- (a) Before the union of the pollen nucleii.  
 (b) After the exit of the sperm nucleii from the pollen tube.

H - "Help cells", E - Egg cell, En - Egg cell nucleus,  
 P<sub>1</sub> and P<sub>2</sub> - Polar nucleii, G - Anti-podal cells, Pt -  
 Pollen tube, 1GSn - First generative sperm nucleus,  
 2GSn - Second generative sperm nucleus.

furnishes the best known material for the illustration of this phenomenon. It is a fact recognized by any one interested in agricultural work that corn crosses readily in the field, also that it shows the effect of such crossing in the first year. Corn is known as a cross fertilized plant, the pollen being carried by the wind.



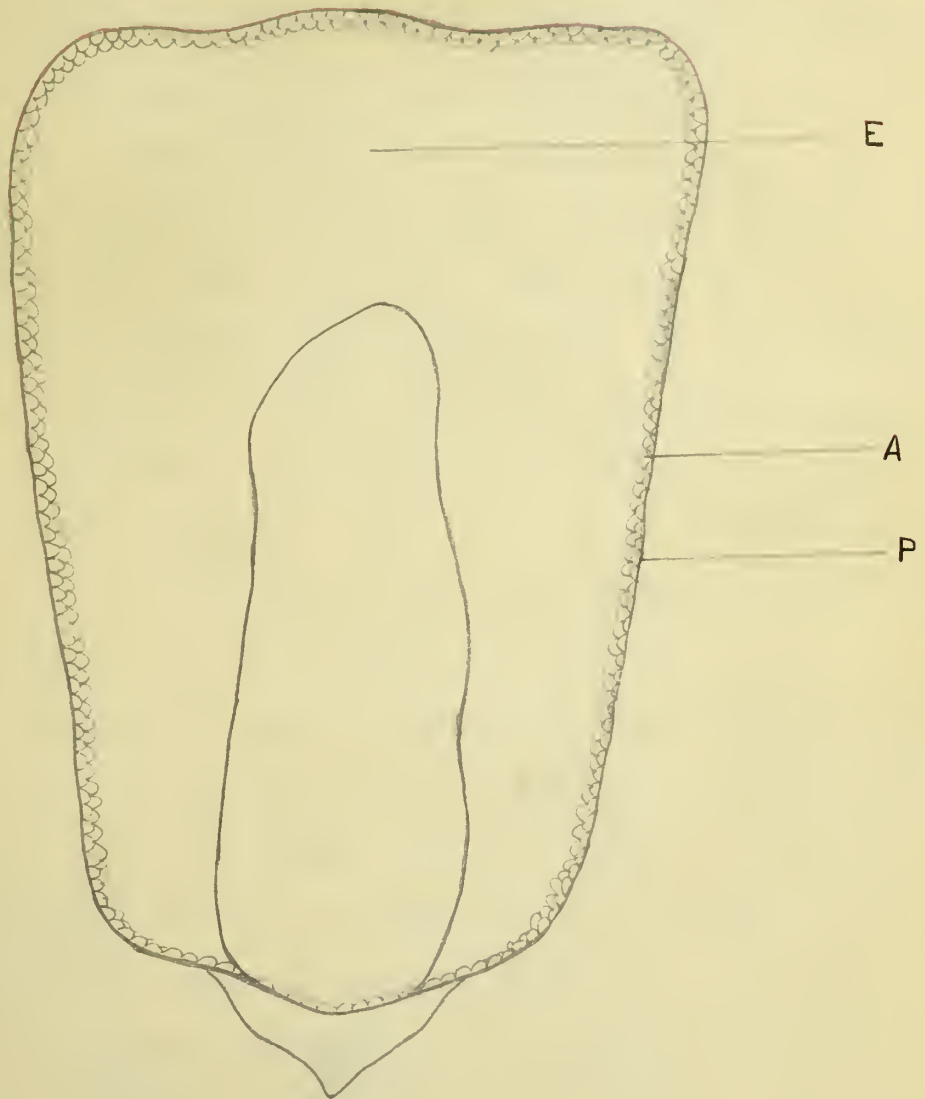


Figure II

Diagram of the Cross Section of a Corn Kernel.

P - Pericarp, A - Aleurone layer, E - Endosperm.



Let us consider then what characters may or may not be affected by xenia. Reference to figure II on page 4 showing the structure will make clear the principles involved here.

The seed coat characters are not affected ~~by~~<sup>thru</sup> crossing because the seed coat is formed with the cob and belongs entirely to the mother plant, hence any peculiar marking as color etc. in the seed coat is determined in the mother plant. <sup>The</sup> Aleurone layer may be affected thru xenia, that is it may carry color or it may not depending entirely upon the dominance of the character brought in by the pollen. The composition of the endosperm is another character which is readily affected by xenia, again depending upon the dominance. When it comes to such characters as size and form it is apparent that these depend upon, and are determined mainly by the seed coat.

A good illustration may be given in a cross between Boone County White and Black Mexican corn. Each one of these varieties has a character that is dominant over the other. In the Boone County White the smoothness is dominant over wrinkled in Black Mexican; on the other hand the purple aleurone of the Black Mexican is dominant over the white aleurone of the Boone County White. The cross which ever way it is made gives a kernel with a purple aleurone layer. In this case the cross becomes evident in <sup>the</sup> current generation from the fact that characters from each of the parent plants are visible.

The problem of this thesis is to investigate some of the xenia effects in crosses among certain varieties of corn. In this study three kinds of characters are considered, namely, color,



shape, and composition.

The field work for this thesis was done on a vacant lot belonging to my father in Appleton City, St. Clair County, Missouri. The type of soil is a gray silt loam with a more or less tight clay subsoil. However the plot is well drained and quite rich in plant food, for a great deal of manure has been applied during the past few years. The plot is completely isolated from any other field of corn for at least 80 - 100 rods. A row of trees on the whole north side of the plot proved to be detrimental toward securing the best results later in the season.

All of the seed was obtained from the University of Illinois. Dr. L. H. Smith with his associates have worked with the different varieties of corn and all were supposedly pure.

The rows in the plot ran north and south; each row was designated by a letter. The following types were planted; *Zea mays*, two varieties, Black Pop and Tom Thumb; *Zea saccharata*, four varieties, Pride of Nishua, Black Mexican, Country Gentleman, and Egyptian Sweet; *Zea indentata*, three varieties, Crimson Dent, Low Ear, and Boone County White. The last named variety had been grown on the plot the previous year. The following page shows the diagram of the arrangement of the plot.

Each of these varieties occupied a separate row, one stalk to a hill and the hills about 20" apart. The rows were 100' long, this allowed 60 plants to the row which gave altogether about 650 plants to work with.

The corn was planted May 9, 1912 with the exception of Country Gentleman and Egyptian Sweet, which thru error were planted 10 days later. However this did not affect the plants very



Diagram of the Plot.

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A - Black Pop.
B - Tom Thumb.
C - Crimson Dent.
D - Low Ear.
E - Pride of Nishua.
F - Black Mexican.
G - Country Gentleman.
H - Egyptian Sweet.
I - Boone County White.

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much when the time for hand pollination began for it seemed that these varieties hurried in development just a little and came on about the same time.

As a guide for conducting the work the following table was made out by Dr. W. B. Gernert of the University of Illinois showing the approximate time when the tassels and silks were expected to appear. These dates were taken from work that Dr. Gernert had been conducting at the station. I have added to this table of expected dates the actual date of appearance of silks and tassels.





Taken July 4, 1912.



Taken July 12, 1912.

Pictures showing a general view of the plot.



Approximate Time of Appearance of Tassels  
and Silks

	Approx- imate No of Days	Date Ex- pected	Date Tas- sels Ap- peared	Date Silks Ap- peared
A - Black Pop	87	July 29	July 12	July 23
B - Tom Thumb	83	" 25	" 12	" 22
C - Crimson Dent	81	" 23	" 4	" 15
D - Low Ear	77	" 19	" 4	" 14
*E - Pride of Nishua	71	" 13	" 6	" 14
*F - Black Mexican	67	" 9	June 23	June 26
**G - Country Gentleman	81	Aug. 2	July 6	July 11
**H - Egyptian Sweet	79	July 31	July 6	" 11
I - Boone County White	81	" 23	" 6	" 12

\* Should have been planted May 19, by mistake was planted May 9.

\*\* Should have been planted May 9, by mistake was planted May 19.

The average time between the first appearance of the tassels and the first appearance of the silks was from 3 - 11 days.

A noticeable feature was the extreme earliness of the Black Mexican corn. It required only 51 days from the time planted for the first appearance of tassels.

Following is a table showing the variety and the number of plants secured.



Variety	Number
A - Black Pop	46
B - Tom Thumb	42
C - Crimson Dent	33
D - Low Ear	41
E - Pride of Nishua	41
F - Black Mexican	41
G - Country Gentleman	63
H - Egyptian Sweet	46
I - Boone County White	3 rows

The guide used in carrying on the work in the field was "Methods in the Artificial Pollenation of Corn" by W. B. Gernert<sup>(7)</sup>. A few details were changed as for example instead of the special box to keep out foreign pollen an umbrella was used. The common 10 pound grocery bags were used for both tassel and shoot instead of the special parchment paper bag recommended.

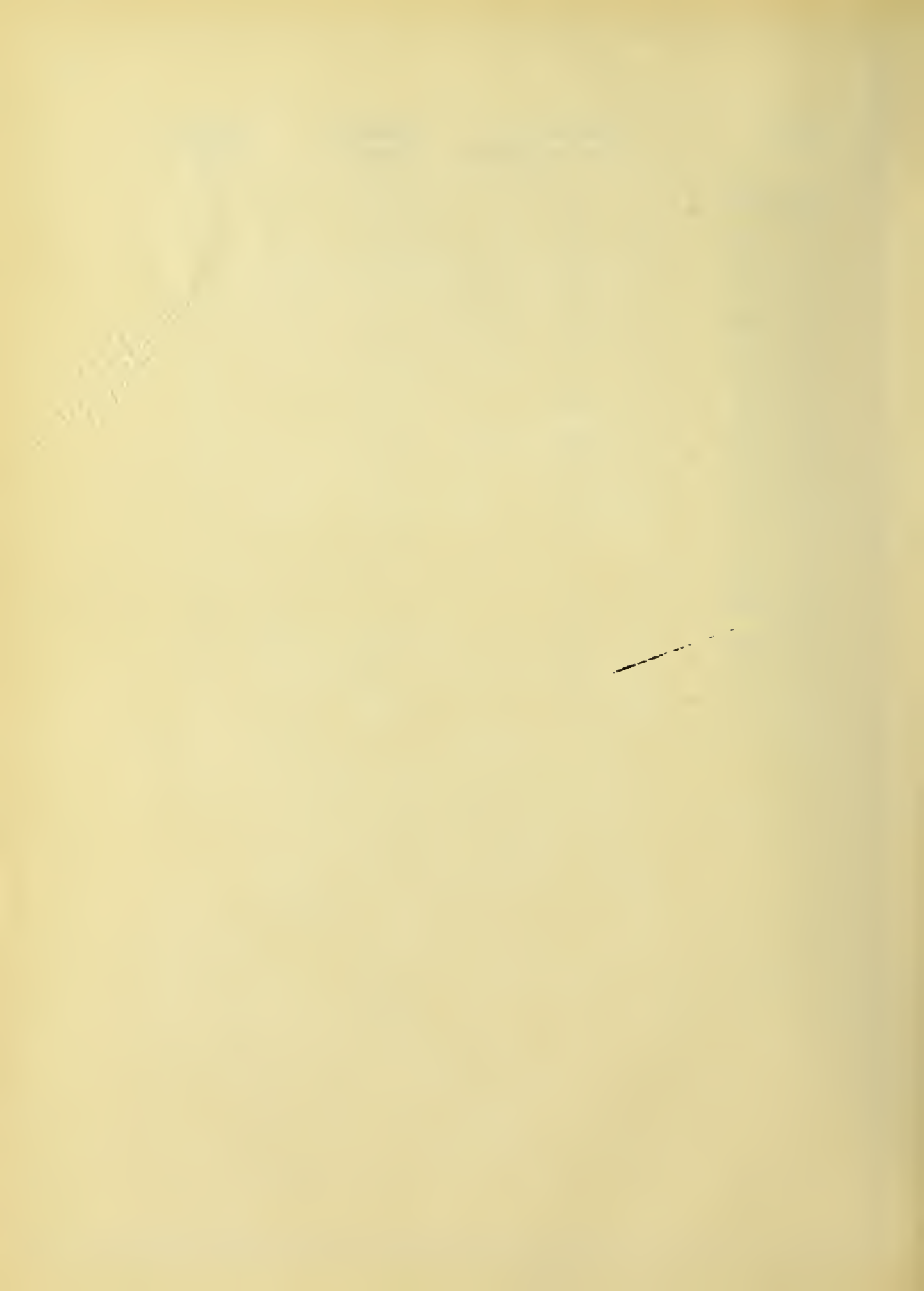
Following is the data showing the work arranged with reference to each variety used.

A - Black Pop

July 6 Good, even, thrifty stand of corn, no suckers, brace roots just started, color of brace roots a fiery red.



Time	Tassels as they appeared	Tassels Bagged	Shoots Bagged
July 12	1	0	0
" 13	2	0	0
" 15	3	0	0
" 16	4	0	0
" 18	7	0	0
" 19	9	0	0
" 20	17	2	0
" 21	0	0	2
" 23	0	3	8
" 24	0	0	1
" 25	0	8	4
" 27	0	5	5
" 30	0	0	1



Crosses Made			Time
Black Pop	♀ X Country Gentleman ♂		July 24
"	♀ X Crimson Dent ♂		" 30
"	♀ X " " ♂		" 30
"	♀ X " " ♂		" 30
"	♀ X " " ♂		" 30
"	♀ X Boone County White ♂		" 30
"	♀ X Low Ear ♂		" 30
"	♀ X Black Mexican ♂		" 30
"	♀ X Pride of Nishua ♂		" 30
"	♀ X Egyptian Sweet ♂		" 30
"	♀ X " " ♂		" 30
"	♀ X Self ♂		Aug. 2
"	♀ X Egyptian Sweet ♂ & Low Ear ♂		" 2
"	♀ X Crimson Dent ♂ & Tom Thumb ♂		" 2
"	♀ X Black Mexican ♂ & Pride of Nishua ♂ & Country Gentleman ♂		" 2

### B - Tom Thumb.

June 28 - Removed all suckers.

July 6 - Corn is not as even and did not come up as well as A.

Suckers very freely, four or five shoots to each stalk.

Time	Tassels as they appeared	Tassels Bagged	Shoots Bagged
July 9	0	0	0
" 12	2	0	0
" 13	2	0	0
" 15	6	0	0
" 16	7	0	0
" 18	15	0	0



July 19	17	1	3
" 20	32	2	2
" 21	34	0	2
" 22	0	0	2
" 23	0	0	5
" 24	0	3	8
" 25	0	10	11
" 27	0	5	4
" 29	0	4	4

## Crosses Made

## Time

Tom Thumb	♀	X	Low	Ear	♂	July 22
"	♀	X	"	"	♂	" 24
"	♀	X	"	"	♂	" 30
"	♀	X	"	"	♂	" 30
"	♀	X	Egyptian Sweet			" 24
"	♀	X	"	"	♂	" 30
"	♀	X	"	"	♂	" 30
"	♀	X	"	"	♂	" 30
"	♀	X	"	"	♂	" 30
"	♀	X	"	"	♂	" 30
"	♀	X	Country Gentleman			" 24
"	♀	X	"	"	♂	" 30
"	♀	X	"	"	♂	" 30
"	♀	X	"	"	♂	" 30
"	♀	X	"	"	♂	" 30
"	♀	X	"	"	♂	" 30



Tom Thumb	♀	X	Crimson Dent	♂	July 24
"	"	♀	X	"	" 30
"	"	♀	X	"	" 30
"	"	♀	X	Black Mexican	" 30
"	"	♀	X	Pride of Nishua	" 30
"	"	♀	X	Black Pop	" 30
"	"	♀	X	Boone County White	" 30
"	"	♀	X	"	" 30
"	"	♀	X	"	" 30
"	"	♀	X	Low Ear	Aug. 2
"	"	♀	X	Black Pop	" 2
"	"	♀	X	Selfo	" 2
"	"	♀	X	Boone County White & Country	
Gentleman ♂ & Tom Thumb ♂					" 2

### C - Crimson Dent.

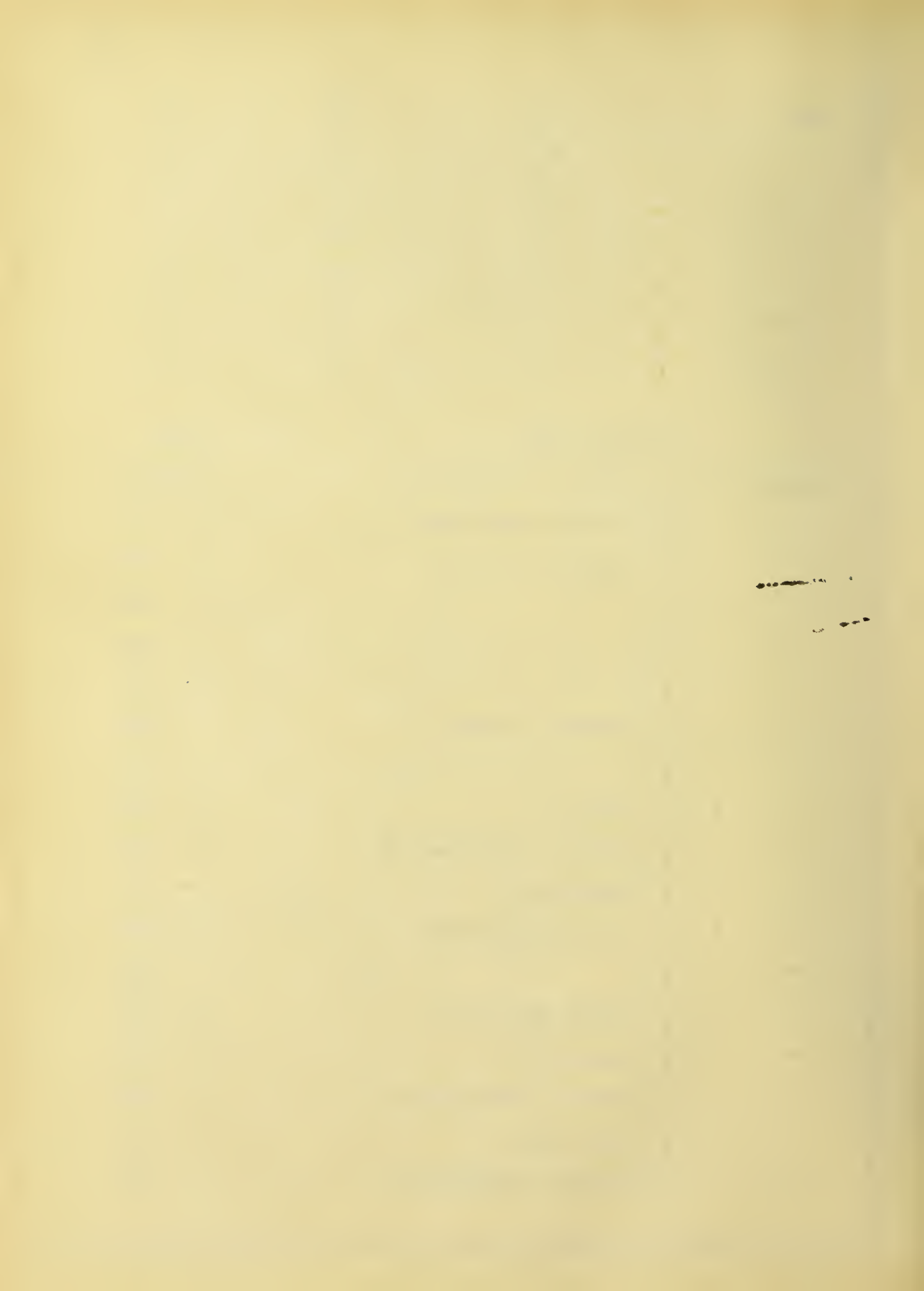
July 6 - Corn is very irregular in size, four or five stalks are tall and thick, the others are only medium sized. Corn is thrifty. Brace roots just started.

Time	Tassels as they appear	Tassels Bagged	Shoots Bagged
July 4	1	0	0
" 6	1	0	0
" 9	5	0	0
" 10	13	0	0
" 11	15	0	0
" 12	16	1	6



July 13	20	6	3
" 15	26	0	1
" 16	26	1	3
" 18	0	5	6
" 19	0	0	8
" 20	0	5	4
" 21	0	4	0

Crosses Made				Time
Crimson Dent	♀	X	Pride of Nishua ♂	July 15
" "	♀	X	Country Gentleman ♂	" 15
" "	♀	X	Egyptian Sweet ♂	" 16
" "	♀	X	" " ♂	" 18
" "	♀	X	" " ♂	" 22
" "	♀	X	" " ♂	" 22
" "	♀	X	Pride of Nishua ♂	" 22
" "	♀	X	" " " ♂	" 22
" "	♀	X	Self ♂	" 22
" "	♀	X	Country Gentleman ♂	" 22
" "	♀	X	Low Ear ♂	" 22
" "	♀	X	Boone County White ♂	" 22
" "	♀	X	" " " ♂	" 22
" "	♀	X	Black Mexican ♂	" 22
" "	♀	X	Low Ear ♂	" 22
" "	♀	X	Boone County White ♂	" 22
" "	♀	X	Tom Thumb ♂	" 26
" "	♀	X	Country Gentleman ♂	" 25



Crimson Dent ♀	X Egyptian Sweet ♂	July 25
" " ♀	X Black Pop ♂	" 25
" " ♀	X " " ♂	" 25
" " ♀	X " " ♂	Aug. 6
" " ♀	X Tom Thumb ♂	July 30
" " ♀	X Egyptian Sweet ♂ & Crimson Dent ♂	
	& Low Ear ♂ & Country Gentleman ♂	" 22

### D - Low Ear.

July 6 - Corn is thrifty. Aside from Tom Thumb is the smallest corn in the plot. Stand is not so good as in the other corn. Brace roots just started.

Time	Tassels as they appear	Tassels Bagged	Shoots Bagged
July 4	4	0	0
" 6	6	0	0
" 9*	15	0	0
" 10	21	0	0
" 11	22	1	0
" 12	22	1	1
" 13	23	5	6
" 15	27	2	2
" 16	29	7	3
" 18	0	4	3
" 19	0	0	8
" 20	0	1	1
" 21	0	4	1

\* July 9th 62 shoots were present.



Crosses Made			Time
Low Ear ♀	X Pride of Nishua ♂		July 15
" " ♀	X Black Mexican ♂		" 15
" " ♀	X Country Gentleman ♂		" 15
" " ♀	X " " ♂		" 18
" " ♀	X Boone County White ♂		" 18
" " ♀	X Self ♂		" 22
" " ♀	X Country Gentleman ♂		" 22
" " ♀	X Tom Thumb ♂		" 22
" " ♀	X Egyptian Sweet ♂		" 22
" " ♀	X Boone County White ♂		" 22
" " ♀	X Black Pop ♂		" 26
" " ♀	X " " ♂		" 26
" " ♀	X Boone County White ♂		
	Egyptian Sweet ♂		
	Country Gentleman ♂		
	Black Mexican ♂		
	Pride of Nishua ♂		
	Low Ear ♂		" 16

### E - Pride of Nishua.

June 28th - Suckering some but not as much as (F) Black Mexican.

Removed all suckers.

July 6 - Corn looks well and is thrifty. Brace roots just starting. Tassels and shoots are appearing.

July 9 - A noticeable characteristic of this corn is a very broad leaf.



July 10 - An insect is working on the tassels of this corn.

Time	Tassels as they appear	Tassels Bagged	Shoots Bagged
July 6	9	0	0
" 9*	16	0	0
" 10	21	0	0
" 11	22	0	0
" 12	23	1	4
" 13	26	10	11
" 15	32	2	8
" 16	34	3	3
" 18	0	2	1
" 20	0	0	2
" 21	0	2	0

\*July 9th 37 shoots were present.

Crosses Made				Time
Pride of Nishua ♀	X	Black Mexican ♂		July 12
" " ♀	X	Low Ear ♂		" 15
" " ♀	X	Crimson Dent ♂		" 15
" " ♀	X	Country Gentleman ♂		" 15
" " ♀	X	Egyptian Sweet ♂		" 15
" " ♀	X	" " ♂		" 16
" " ♀	X	Boone County White ♂		" 18
" " ♀	X	" " " ♂		" 18
" " ♀	X	" " " ♂		" 18
" " ♀	X	Low Ear ♂		" 18



Pride of Nishua	♀	X Low Ear	♂	July 18
" " "	♀	X " "	♂	" 18
" " "	♀	X Crimson Dent	♂	" 18
" " "	♀	X Country Gentleman	♂	" 18
" " "	♀	X " "	♂	" 18
" " "	♀	X Egyptian Sweet	♂	" 18
" " "	♀	X Low Ear	♂	" 20
" " "	♀	X Country Gentleman	♂	" 20
" " "	♀	X Crimson Dent	♂	" 20
" " "	♀	X Boone County White	♂	" 20
" " "	♀	X " " "	♂	" 20
" " "	♀	X Crimson Dent	♂	" 20
" " "	♀	X Black Mexican	♂	" 22
" " "	♀	X Boone County White	♂	" 22
" " "	♀	X Black Pop	♂	" 26
" " "	♀	X " " "	♂ Crimson Dent	♂ Aug. 2
" " "	♀	X Low Ear	♂ Pride of Nishua	♂ July 20
" " "	♀	X Egyptian Sweet	♂	
		Black Mexican	♂	
		Pride of Nishua	♂	" 20

#### F - Black Mexican.

June 23 - Ten stalks were tasseled on this date making it only 51 days from the time of planting. Suckers very freely.

June 24 - Suckers removed.

July 4 - Bagged 14 tassels and as many shoots. Some pollen has fallen but not much. Again removed suckers. Shoots very



numerous 3 to 4 on a stalk.

Time	Tassels as they appear	Tassels Bagged	Shoots Bagged
June 23	10	0	0
July 4	0	18	20
" 5	0	2	3
" 7	0	9	12
" 8	0	1	1
" 10	0	Bagged 1 sucker	0
" 19	0	1	2

Crosses made							Time
Black Mexican	♀	X	Boone County	White	♂		July 10
"	♀	X	"	"	♂		" 11
"	♀	X	"	"	♂		" 11
"	♀	X	"	"	♂		" 11
"	♀	X	"	"	♂		" 12
"	♀	X	"	"	♂		" 12
"	♀	X	"	"	♂		" 12
"	♀	X	"	"	♂		" 12
"	♀	X	"	"	♂		" 12
"	♀	X	"	"	♂		" 12
"	♀	X	Low Ear		♂		" 13
"	♀	X	Pride of Nishua		♂		" 13
"	♀	X	Black Pop		♂		" 26
"	♀	X	Tom Thumb		♂		" 26
"	♀	X	Black Pop		♂		" 26



Black Mexican ♀	X Country Gentleman ♂	July 26
" " ♀	X Egyptian Sweet ♂	" 26
" " ♀	X Crimson Dent ♂	" 26
" " ♀	X Low ear ♂	" 26

G - Country Gentleman.

June 28 - Vigorous grower. Suckers quite freely. Removed all suckers.

July 6 - Corn is very vigorous in growth. 22 tassels just appearing, also brace roots and shoots. Good even stand of corn.

July 9 - Some of the corn has as many as 4 or 5 shoots.

Time	Tassels as they appear	Tassels Bagged	Shoots Bagged
July 6	22	0	0
" 9*	38	1	0
" 10	45	0	0
" 11	46	0	0
" 12	46	0	0
" 13	46	12	17
" 15	0	5	9
" 16	0	5	2
" 18	0	11	0
" 19	0	2	0

\* There were 41 shoots present on July 9th.



Crosses made						Time	
Country Gentleman	♀	X	Low Ear	♂		July 16	
"	♀	X	" "	♂		"	18
"	♀	X	" "	♂		"	21
"	♀	X	" "	♂		"	21
"	♀	X	" "	♂		"	25
"	♀	X	Tom Thumb	♂		"	21
"	♀	X	" "	♂		"	21
"	♀	X	" "	♂		"	26
"	♀	X	Country Gentleman	♂		"	21
"	♀		(Lige bred)				
"	♀	X	Tom Thumb	♂		"	23
"	♀	X	Crimson Dent	♂		"	21
"	♀	X	" "	♂		"	23
"	♀	X	" "	♂		"	23
"	♀	X	Black Mexican	♂		"	21
"	♀	X	Pride of Nishua	♂		"	21
"	♀	X	Boone County White	♂		"	21
"	♀	X	" "	♂		"	21
"	♀	X	" "	♂		"	23
"	♀	X	" "	♂		"	23
"	♀	X	Pride of Nishua	♂		"	23
"	♀	X	Self	♂		"	23
"	♀	X	Egyptian Sweet	♂		"	23
"	♀	X	" "	♂		"	23
"	♀	X	Black Pop	♂		"	26
"	♀	X	Pride of Nishua	♂			
			Boone County White	♂		"	18



Country Gentleman ♀ X Pride of Nishua ♂

Country Gentleman ♂

July 21

H - Egyptian Sweet.

June 28 - Removed suckers. This corn does not sucker as freely as any of the other varieties.

July 6 - Corn is short, but it has 20 tassels just appearing, also brace roots are appearing.

July 9 - Some corn has as many as 4 shoots to a stalk. However one of the very noticeable features is the lack of shoots.

Time	Tassels as they appear	Tassels Bagged	Shoots Bagged
July 6	20	0	0
" 9*	27	0	0
" 10	30	1	0
" 11	31	7	0
" 12	32	6	0
" 13	33	2	5
" 15	37	3	0
" 16	0	0	4
" 18	0	5	6
" 19	0	0	8
" 22	0	3	0
" 23	0	3	0
" 24	0	1	0

\* There were 24 shoots present July 9th.



Crosses made				Time
Egyptian Sweet	♀	X	Pride of Nishua ♂	July 16
"	"	♀	X Boone County White ♂	" 16
"	"	♀	X Low Ear ♂	" 16
"	"	♀	X Boone County White ♂	" 16
"	"	♀	X " " " ♂	" 20
"	"	♀	X " " " ♂	" 20
"	"	♀	X Low Ear ♂	" 20
"	"	♀	X Country Gentleman ♂	" 20
"	"	♀	X " " " ♂	" 22
"	"	♀	X Selfed ♂	" 22
"	"	♀	X Black Pop ♂	" 25
"	"	♀	X " " ♂	" 25
"	"	♀	X " " ♂	" 29
"	"	♀	X Tom Thumb ♂	" 25
"	"	♀	X " " ♂	" 29
"	"	♀	X Low Ear ♂	" 25
"	"	♀	X Egyptian Sweet ♂	.
			Country Gentleman ♂	
			Pride of Nishua ♂	
			Low Ear ♂	
			Crimson Dent ♂	
			Boone County White ♂	" 22



I - Boone County White.

July 6 - Very strong and vigorous growth. Some stalks over eight feet high. Three tassels have appeared at this date.

Time	Tassels as they appear	Tassels Bagged	Shoots Bagged
July 6	3	0	0
" 8	No further data	2	0
" 10	was kept after	2	1
" 12	tassels started	0	4
" 16	to appear.	0	3
" 18		0	1
" 20		0	8
" 22		0	8
" 31		0	11

## Crosses made

				Time
Boone County White	♀	X Black Mexican	♂	July 10
" "	♀	X " "	♂	" 12
" "	♀	X Low Ear	♂	" 27
" "	♀	X " "	♂	" 27
" "	♀	X Crimson Dent	♂	" 27
" "	♀	X " "	♂	" 27
" "	♀	X Pride of Nishua	♂	" 27
" "	♀	X Boone County White	♂	" 27
" "	♀	(Line Bred)		
" "	♀	X Egyptian Sweet	♂	" 27
" "	♀	X Country Gentleman	♂	" 27



Boone County White	♀	X Country Gentleman	♂	July 30
" " "	♀	X " "	♂	" 30
" " "	♀	X " "	♂	" 30
" " "	♀	X Tom Thumb	♂	" 31
" " "	♀	X " "	♂	Aug. 12
" " "	♀	X Black Pop	♂	" 12
" " "	♀	X Self	♂	" 2
" " "	♀	X Black Pop	♂	"
Boone County White				♂ " 2

#### J - Black Mexican. (606)

This is a second planting of Black Mexican which was planted after it was found that the Black Mexican of the first planting was too early for crossings. Planted June 29th.

July 6 - Out of 81 plants that are up 22 are albinos.

No crosses were made in this corn for it was much too late to do any good.

The material was harvested and brought to the University for further investigation. During the winter a study was made in the laboratory of the effects produced with reference to the characters pertaining to color, shape, and composition. The data obtained from this study are summarized and presented in the following tables.



Variety and Cross made	Peri- carp	Aleur- one	Endo- sperm	Shape	Compo- sition	No. of Kernels
<u>Mother Ear - Black Pop</u>	Straw	Purpl- ish Brown	Yellow tinge	Point ed	Flinty	----
Black Pop ♀ X Crimson Dent ♂	Color- less	"	Light drab	"	Flinty Starch	68
" " ♀ X Tom Thumb ♂ & Crim- son Dent ♂	"	"	Yellow tinge	"	Flinty with a trace of starch	253
" " ♀ X Self ♂	"	"	"	"	Flint	197
" " ♀ X Boone County white ♂	"	"	"	"	Flinty with con- siderable starch	244
" " ♀ X Egyptian Sweet ♂ & LowEar ♂	"	"	"	"	Flint with starch pocket	58
<u>Mother Ear - Tom Thumb</u>	"	Color- less	Yellow	"	Flinty	----
Tom Thumb ♀ X Black Pop ♂	"	"	"	"	Flint	Lost label
" " ♀ X Crimson Dent ♂	"	"	"	"	"	58
" " ♀ X Boone Co. White ♂ & Country Gentleman ♂	"	"	"	Round- ing	Flint with starch pocket	2
" " ♀ X Egyptian Sweet ♂	"	"	"	Point- ed	Flint	7
" " ♀ X Self ♂	"	"	"	"	"	29
<u>Mother Ear - Crimson Dent</u>	Dark red	"	Color- less & Yellow	Medi- um Dent	Starchy	----
Crimson Dent ♀ X Egypt-Red ian Sweet ♂	"	"	Yellow	Broad	"	63
" " ♀ X Boone County White ♂	"	"	"	"	"	2



Variety and Cross made		Peri- carp	Aleur- one	Endo- sperm	Shape	Compo- sition	No. of Kernels
Crimson Dent ♀	X Boone County White ♂	Red	Color- less	Yellow	Broad	Starchy	76
"	" ♀ X Low Ear ♂	"	"	"	"	"	102
"	" ♀ X Egyptian Sweet ♂ & Country Gentleman ♂ & Black Mexican ♂	Dark Red	"	"	Round- ed or Dimple Dent	"	23
<u>Mother Ear - Low Ear</u>		Color- less	Color- less	"	Wedge	"	----
Low Ear ♀	X Egyptian Sweet ♂	Redish tinge	"	"	Spher- ical (smooth)	"	6
"	" ♀ X Boone Coun- ty White ♂ Egyptian Sweet ♂ Country Gen- tleman ♂ Pride of Nishua ♂	"	"	"	Flat (smooth)	Flinty dent	25
"	" ♀ X Boone Coun- ty White ♂	Color- less	"	"	Irreg- ular	Starchy	5
"	" ♀ X " " ♂	"	"	"	"	"	64
"	" ♀ X Black Pop ♂	"	Calico (purpl- ish)	"	Round	Starchy flint	2
"	" ♀ X Pride of Nishua ♂	Red- dish tinge	Color- less	"	Irreg- ular	Starchy	17
<u>Mother Ear - Pride of Nishua</u>		Color- less opaque	"	"	Wrink- led	Flinty	----
Pride of Nishua ♀	X Country Gentleman ♂	Color- less	"	Dull Yellow	"	Flint	101
"	" ♀ X Low Ear ♂	"	"	Yellow	smoo- th	$\frac{1}{2}$ Starch $\frac{1}{2}$ Flint	3
"	" ♀ X Country Gentleman ♂	"	"	"	Wrin- kled	Flint	91



Variety and Cross made		Peri- carp	Aleur- one	Endo- sperm	Shape	Compo- sition	No. of Kernels
Pride of Nishua ♀	X Crimson Dent ♂	Color less	Color- less	Yellow	Smooth	Starchy	29
"	" ♀ X " " ♂	"	"	"	"	"	64
"	" ♀ X " " ♂	"	"	"	"	"	12
"	" ♀ X Country Gentleman ♂	"	"	"	Wrin- kled	Flint	1
"	" ♀ X Boone Coun- ty White ♂	"	"	"	Smooth	Starchy	83
"	" ♀ X " " " ♂	"	"	"	"	"	27
"	" ♀ X Low Ear ♂	"	"	"	"	"	4
"	" ♀ X " " ♂	"	"	"	"	"	77
"	" ♀ X Egyptian Sweet ♂	"	"	"	Wrin- kled	Flint	65
"	" ♀ X Black Mex- ican ♂ Egyptian Sweet ♂	"	"	Yellow	"	"	4
"	" ♀ X Low Ear ♂	"	"	"	Smooth	Starchy	
<u>Mother Ear - Black Mex- ican</u>		"	Dark purpl- ish	Color- less	Wrin- kled	Flint with some starch	----
Black Mex- ican ♀	X Boone Coun- ty White ♂	"	Purple	"	Smooth	Flinty	5
"	" ♀ X " " " ♂	"	"	"	"	"	27
"	" ♀ X Country Gentleman ♂	"	"	"	Wrin- kled	"	3
"	" ♀ X Self ♂	"	"	"	"	"	88
<u>Mother Ear - Country Gentleman</u>		"	Color- less	"	"	Flint	----
Country Gentleman ♀	X Crimson Dent ♂	"	"	"	Smooth	Flinty starch pocket	4



Variety and Cross made		Peri- carp	Aleur- one	Endo- sperm	Shape	Compo- sition	No. of Kernels
Country Gentleman	X Pride of Nishua	♀	♂	Color- less	Color- less	YellowWrin- kled	7
" "	X Low Ear	♀	♂	"	"	Smooth	1
" "	X Black Mex- ican	♀	♂	"	Purple	Color- less	9
" "	X Tom Thumb	♀	♂	"	Color- less	"	1
" "	X Low Ear	♀	♂	"	"	Yellow	5
" "	X Egyptian Sweet	♀	♂	"	"	Color- less	3
" "	X Boone County White	♀	♂	"	"	"	5
" "	X " " "	♀	♂	"	"	"	267
" "	X " " "	♀	♂	"	"	"	55
<u>Mother Ear - Egyptian Sweet</u>				"	"	Color- less	Flint
Egyptian Sweet	X Country Gentleman	♀	♂	"	"	"	169
" "	X Self	♀	♂	"	"	"	11
" "	X Pride of Nishua	♀	♂	"	"	Yellow	4
" "	X Boone Coun- ty White	♀	♂	"	"	Color- less	6
(Due possibly to self fertilization)							
" "	X Country Gentleman	♀	♂	"	"	"	31
" "	X Tom Thumb	♀	♂	"	"	YellowSmooth	Flint
" "	X Black Pop	♀	♂	"	Purpl- ish gray	"	10



Variety and Cross Made	Peri- carp	Aleur- one	Endo- sperm	Shape	Compo- sition	No. of Kernels
Egyptian X Boone coun- Sweet ♀ ty White ♂	Color- less	Color- less	Color- less	Smooth	Flint	1
" " ♀ X Country Gentleman ♂ Egyptian Sweet ♂ Pride of Nishua ♂ Crimson Dent ♂ Boone coun- ty White ♂						
Four kinds of Grain 1	"	"	Yellow	Smooth	Flinty	
2	"	"	"	Wrink- led	"	23
3	"	"	Color- less	Smooth	"	
4	"	"	"	Wrink- led	"	
*" " ♀ X Low Ear ♂ Egyptian Sweet ♂	"	"	"	"	"	80
*" " ♀ X " " " " ♂	"	"	Yellow	Smooth	Starch	2
<u>Mother Ear - Boone County White</u>	"	"	Color- less	Wedge	"	---
Boone Coun- X Black ty White ♀ Pop ♂	"	Purpl- ish (calico)	"	Smooth and ir- regular	"	78
" " " ♀ X Pride of Nishua ♂	"	Color- less	Yellow	Smooth and sloping	"	72
" " " ♀ X Line bred ♂	"	"	Color-irregu- less lar	"	"	30
" " " ♀ X Low Ear ♂	"	"	Yellow	"	"	7
" " " ♀ X Pride of Nishua ♂	"	"	"	Smooth	"	19

\* The same ear.



Variety and Cross made	Peri- carp	Aleur- one	Endo- sperm	Shape	Compo- sition	No. of Kernels
Boone Coun- ty White ♀	X Pride of Nishua ♂	Color- less	Color- less	Yellow	Smooth	Starch 1
" " " ♀	X Country Gentle- man ♂	"	"	Color- less	"	" 8
" " " ♀	X Self ♂	"	"	"	"	" 90
" " " ♀	X Line brød ♂	"	"	"	"	" 5
" " " ♀	X Crimson Dent ♂	"	"	"	"	" 8
" " " ♀	X Country Gentle- man ♂	"	"	"	"	" 3
" " " ♀	X Black Pop ♂ Boone County White ♂	"	Deep purple	"	"	Starchy Flint 21

A drouth set in about the last week in May which continued through the whole summer. To still further handicap the work, the row of large trees along the north side of the plot sapped the ground of moisture, affecting the corn to such an extent that a great deal of it dried up. This will account in a large measure for so many poorly filled ears.

The Black Mexican Sweet Corn grew more rapidly, and bore ~~more~~ tassels and silks possibly two weeks earlier than was expected which made it impossible to make many crosses with any of the other corn.



### General Summary.

1 - The work was greatly interfered with on account of the season.

2 - When crossing either of the other types (Dent or Sweet) on the Pop it was extremely difficult to get crosses. However when reciprocal crosses were made, results were more easily obtained.

3 - In crossing a smooth variety with a wrinkled, the smooth shows a complete dominance over the wrinkled.

4 - Purple color in all cases tested, proved to be dominant.

5 - In all cases yellow color was dominant to white. However in some instances the cross showed a very much diluted effect.

6 - As the terms starchiness and flintiness are used in this thesis, starchiness is not absolutely dominant to flintiness. See Country Gentleman X Starchy Varieties.



## Reference List.

- 1 - EAST, E. M., and HAYES, H. K.  
Inheritance in Maize. Bul. Conn. Agr. Exp. Sta. 167 : 1911.
- 2 - EAST, E. M.  
Practical Use of Mendelism in Corn Breeding and Inbreeding  
in Corn. Reprinted from the Rpt. of the Conn. Agr. Exp. Sta.  
1907 - 08.
- 3 - WEBBER, H. J.  
Xenia, or the Immediate Effect of Pollen, in Maize. U. S.  
D. A. Div. of Veg. Physiology and Pathology 1900.
- 4 - CORRENS, C.F.J.E.  
Bastarde Zwischen Maisrassen, mit besonderer Berücksichtigung  
der Xenien. 1901.
- 5 - PUNNETT, R. C.  
Mendelism. 1911.
- 6 - FRUWIRTH, T.  
Die Zuchtung der Landwirtschaftlichen Kultur-pflanzen Vol. I  
1905.
- 7 - GERNERT, W. B.  
Methods in the Artificial Pollenation of Corn. Reprint from  
Proceedings Amer. Breeders Assoc. Vol. VIII Wash. D. C. 1912.
- 8 - HOPKINS, C. G., SMITH, L. H., and EAST, E. M.  
Directions for the Breeding of Corn, Including Methods for  
the Prevention of Inbreeding. Bul. Ill. Agr. Exp. Sta. 100. 1905.
- 9 - SMITH, L. H.  
Ten Generations of Corn Breeding. Bul. Ill. Agr. Exp. Sta.  
128, 1908.



10 - HOPKINS, C. G., SMITH, L. H., and EAST, E. M.

The Structure of the Corn Kernel and the Composition of Its  
Different Parts. Bul. Ill. Agr. Exp. Sta. 87, 1903.





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